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AUTHOR Campbell, Patricia B.
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ABSTRACT

This brochure, one in a series of four, is designed to assist program directors, teachers, and evaluators evaluate programs to encourage girls in mathematics, science, and engineering. Seven sections cover the why, the what, and some of the how of program evaluation. The first section explains why programs need to be evaluated. The second section addresses the question of what must happen for a program to be considered successful. The third section provides four methods by which programs can be evaluated. The fourth section suggests questions that participants should answer to measure attitudes toward the program. The fifth section provides methods by which the information received from evaluation can be utilized. The sixth section suggests that the impact a program has had on participants be examined by making pre- and post-participation comparisons on several variables. The variables include: (1) attitudes toward mathematics and science; (2) mathematics and science courses girls are planning to take; (3) mathematics and science activities girls do voluntarily; (4) knowledge of women in science; (5) career interests; (6) Mathematics and science stereotypes; (7) mathematics and science knowledge; and (8) mathematics and science grades. A final section suggests first steps to evaluate the program. A list of six resources is provided. (MDH)

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Encouraging Girls in Math and Science

What Works and What Doesn't?

Ways to Evaluate Programs for Girls in Math, Science, and Engineering

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Why Evaluate?

Developed for program directors, teachers, and even evaluators, this brochure is designed to help you use evaluation effectively. It covers the why, the what, and at least some of the how of program evaluation.

Just because a program exists doesn't mean that it's doing a good job. Programs done with the best of intentions may have no impact or may even have negative effects, such as making girls feel that combining a science career with a family is just too much work.

Evaluation can be a tool to find out "what's happening" in a program. It can also

- identify program strengths and weaknesses
- spot problem areas and suggest solutions
- provide information on met and unmet needs
- show funders and potential funders what the program does and how it is working

Yet few programs are evaluated. A lack of knowledge of evaluation techniques, limited resources, and a fear that evaluation results will be used against us have led to so little evaluation that programs are identified as "successful" or "exemplary" not because they work but because they have been around for a while or because someone nominated them.

It doesn't have to be that way. The following pages outline some effective, inexpensive techniques you can use to determine how your programs are helping girls and provide some ways they can do it better.

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Discrimination Prohibited: No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance, or be so treated on the basis of sex under most education programs or activities receiving Federal assistance.

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So What Do You Want to Have Happen?

The first step in evaluation is for you to ask: What would need to happen before the program could be considered a success? When you answer this question, watch out for statements that are

too general:
"Girls will be better in math and science."
too long term:
"Girls will become scientists."
beyond program control:
"Girls will like school more (for out-of-school programs)."
or inappropriate for the population:
"Girls, already very interested in math and science, will plan to take more math and science courses."

Possible answers to what you want to have happen because of your program could include

- Girls will become better at designing experiments to find their own answers to science questions.
- Girls will have fewer negative stereotypes about people who are good in math and science.
- Girls will know about more women scientists.
- Girls who plan to take few math and science courses will increase the number of math and science courses they plan to take.

Once definitions of success have been decided, you should ask "What parts of the program will cause these things to happen?" If you don't know, then your definitions of success aren't correct for your program, and either the program or the definitions should be changed.

How's It Going? Checking the Ongoing Program

Program directors, teachers, and evaluators working with people from 6 to 60, have found these useful, "fun" ways to find out how a program is going. They can be used weekly, monthly, or even daily, based on what you want to know.

On the bean

Put three kinds of beans (such as pinto, kidney, and black), or three colors of poker chips in three different cups. Label one cup "GREAT," one "OK," and one "AWFUL." Tell the girls to put beans from each category in a fourth, clear jar, based on how they feel about "what's happening." Looking at the clear jar, you can tell immediately how it's going.

The big three

Ask the girls to write about the program (or some part of it) under the headings of "WHAT I LIKED BEST," "WHAT I LIKED LEAST," and "WHAT WOULD IMPROVE THE PROGRAM." Summarizing their responses provides you with a good overview of how the girls feel.

I think . . .

Either orally or in writing, ask participants to complete one or several of the following sentences: "I THINK THE PROGRAM IS . . ." "TODAY I LEARNED THAT. . ." "IN THE FUTURE I WILL . . ."

On the wall

"The big three" or "I think" can be done "on the wall" as well. Put large sheets of paper on a wall and attach a marker or pen. On the top of the sheet write "WHAT I LIKED BEST" or "TODAY I LEARNED THAT. . ." and so on. Ask the girls to write their responses on the sheets.

If any of these methods shows that things are not going well, talk to the girls and get their ideas for what's wrong and how it could be made better.

Measuring Attitudes Toward the Program

At the end of the program, the girls should answer questions about the program and how they feel about it. These could include

- ratings of each part of the program on a scale of 1 (Great) to 5 (Awful)
- what they learned from the program
- whether they would like to come back to the program or if they would recommend it to others, and why or why not

The questions can be answered in writing or in an interview. Either way, all responses should be anonymous or confidential.

Using the Information

Information is of no value unless it is used. To use the information consider

- computing an "average" or mean rating for each program component
- looking at those components with ratings higher or lower than the rest
- deciding what commonalities exist between those rated best and those rated worst

Open-ended questions, such as "What did you learn?" can be summarized by

- reading the answers
- seeing the categories into which they fall (such as new friends, increased confidence, increased math skills)
- counting how many answers fit in each category

Break down the information by race so you can look at the responses of girls from different racial and ethnic groups as well as girls as a whole. Use the information to make revisions where you can.

Be sure to give the girls feedback. If you ask for their opinions or suggestions, let them know what you found and how it will be used. People give better information when they know it will be used.

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How's the Program Affecting Girls?

To look at the impact of a program, you must be able to make comparisons. While the best comparisons are with a "control" group of girls who are not in your program, these types of comparison groups are difficult to find. You can, however, collect information from girls at the beginning and end of the program and make "pre/post" comparisons.

Pre/post comparisons can be done fairly easily and inexpensively. Follow-up is more difficult but provides very useful information. Questioning girls six months to a year after they complete the program helps to find out what the impact of the program really is.

It is tremendously important that the questions you ask reflect your definitions of program success. Thus, if the program seeks to reduce stereotypes, ask questions about stereotypes and how they have changed. Other, open-ended questions about the program and its impact help to show if there are effects that you might not have considered.

Inexpensive, effective measurement tools include

Attitudes toward math and science

The "Fennema Sherman Mathematics Attitude Scale" provides scores related to math anxiety, confidence, usefulness, view of math as a male domain and other areas.

Girls can be asked to list the science or math areas in which they feel *most* comfortable and those in which they feel *least* comfortable.

Math and science courses girls are planning to take

You can make a list of high school math and science courses and ask the girls to mark the courses they have taken or plan to take. If possible, use the names schools give to the courses in order to avoid confusion.

Math and science activities girls do voluntarily

"What Do You Do?" (an adaptation of Alison Kelly's GIST Attitudes Scales) is a measure of participation in out-of-school science and math activities.

Knowledge of women in science

You can test this by asking girls to write the names of all the women scientists they can think of in two minutes.

Career interests

You can ask girls to list the careers they would like to be doing in ten years and, using a scale of 1 (Very committed) to 5 (Not at all committed), indicate how committed they are to each career.

Math and science stereotypes

You can ask girls open-ended questions:
Why do you feel there are more men than women in science?
What are people who are good in math and science like?
What would be *hardest* about a career in science? What would be *easiest*?

Math and science knowledge

Any cognitive math and science tests used should cover the same information that is covered in the program. If a program goal is to have girls do better on the SAT or other standardized tests, cognitive tests may be the best measures. If you are running an out-of-school program, care should be taken that cognitive tests not be seen as pressuring the girls or making the program "like school."

Math and science grades

Unless your program is school based or is done with a school, it will have little effect on what is taught or how it is taught. It is not realistic to expect that out-of-school programs will have an impact on school grades.

First Steps to Evaluation

Get started. You don't have to start big; finding out what girls think of the program and why can be a big help.

Decide if you want to use outside evaluators. Outside evaluators can help you do the evaluation or provide technical assistance. Colleges, universities, and consulting firms are good sources of evaluators. If you use outside evaluators, make sure that

- they are knowledgeable about issues related to math and science and girls
- they are aware of and sensitive to issues of race and sex
- they are clear about what you want and when you want it

Remember, if the evaluation shows that some aspects of your program are not working, it is not the end of the world. It means you need to rethink the program or at least some parts of it.

What you have learned about your program may help others. Consider sharing your evaluation results through the Math/Science Network (678 13th St., Suite 100, Oakland, CA 94612) and WEPAN (Women in Engineering Program Advocates Network, c/o Women's Programs, Stevens Institute of Technology, Hoboken, NJ 07030). Also consider asking other programs to share their evaluation results with you.

Resources

Campbell, Patricia B. 1985. Program evaluation: Help is on the way. *Equity and Choice*, vol. 1, No. 2: 33–36, 38.

Davis, Barbara, G. and Sheila Humphreys. 1983. *Evaluation counts: A guide to evaluating math and science programs for women*. Oakland, CA: Math/Science Network.

Raupp, Magdala. 1989. *Evaluation management handbook*. Andover, MA: The Network.

The Fennema Sherman Mathematics Attitude Scale is available from The Wisconsin Center for Educational Research, University of Wisconsin, Madison, WI 53706.

"What Do You Do?" is available from Campbell-Kibler Associates, Groton Ridge Heights, Groton, MA 01450.

The research and evaluation results on which this brochure is based are available from Campbell-Kibler Associates, Groton Ridge Heights, Groton, MA 01450.

Other brochures in this series include

"Math, Science, and Your Daughter: What Can Parents Do?"
"Nothing Can Stop Us Now: Designing Effective Programs for Girls in Math, Science, and Engineering"
"Working Together, Making Changes: Working in and out of School to Encourage Girls in Math and Science"

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Illustrations by Judy Butler

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